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Tarantino, E.T.

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**BANKRUPTCY LAW AND CORPORATE INVESTMENT  
DECISIONS**

By Emanuele Tarantino

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# Bankruptcy Law and Corporate Investment Decisions\*

Emanuele Tarantino<sup>†</sup>

TILEC & CentER, Tilburg University

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## Abstract

This paper contributes to the debate on optimal bankruptcy reform by providing a set of results that challenge the wisdom that “soft” bankruptcy codes have necessarily positive effects. The model hinges on the key idea that “soft” bankruptcy allows a poor performing entrepreneur to renegotiate the terms of the initial contract with a lender. In the presence of moral hazard, the optimal arrangement requires the hampering of project’s continuation as punishment for poor performance. However, if the lender can increase recovery rates in bankruptcy such punishment is not renegotiation-proof. Clearly, this exacerbates the agency problem and creates a tension between ex-post and ex-ante efficiency that may impede the implementation of long-term projects.

**JEL codes:** D82, G33, K22.

**Keywords:** Bankruptcy Law, Financial Contracts, Limited Commitment, Soft budget constraint, Short-termism.

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<sup>†</sup>Address: Tilburg University, Department of Economics, P.O. Box 90153, NL-5000 LE, Tilburg, The Netherlands. E-mail: E.Tarantino@uvt.nl.

# 1 Introduction

The literature in the fields of law and economics has traditionally distinguished the American “soft” approach to bankruptcy from the “tough” one of European legislators. Recently, this dichotomy has been put at stake by a process of convergence due to the adoption, in major European countries, of bankruptcy codes inspired by U.S. Chapter 11. The European Commission has undertaken important actions to support this process, based on the presumption that a harsh approach to failure would deter risk taking, experimentation and innovation:<sup>1</sup> the belief of the Commission is that bankruptcy favors entrepreneurial initiative if it treats failure in a “soft” fashion.

Several European countries have consequently reformed their bankruptcy codes. In Germany, the reform of 1999 introduced a system of corporate reorganization analogous to Chapter 11 in the balance of creditors’ and debtors’ rights. More precisely, as in Chapter 11, Germany’s *Insolvenzverfahren* prescribes the right of the entrepreneur to open the reorganization phase, the automatic stay on creditors’ claims, the super-seniority of lenders that fund the bankrupt firm and creditors’ right to decide over the approval of the reorganization plan. Instead, unlike Chapter 11, it is a court-appointed administrator that formulates the reorganization plan and not the bankrupt management. In Italy, before the 2006 reform, the insolvency procedure was rather “tough” with debtors, as bankrupt entrepreneurs were subject to a long phase of rehabilitation before they could start a new enterprise and have access to new credit. In the current regime, instead, before the opening of the liquidation phase, the entrepreneur has the right to start a process of reorganization (*concordato preventivo*) and negotiate with creditors over the restructuring of outstanding liabilities, as in Chapter 11. In 2005, the French legislator reformed insolvency law introducing the *procédure de sauvegarde*: the new system gives the right to the incumbent management to open the reorganization phase and retain control over the company while devising a restructuring plan, protected also by the automatic stay of creditors’ claims. In other words, Germany, Italy and France implemented a “soft” regime and, more interestingly, the new systems have been designed adopting some of the key features of Chapter 11.<sup>2</sup>

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<sup>1</sup>See the website [http : //ec.europa.eu/enterprise/entrepreneurship/sme2chance/](http://ec.europa.eu/enterprise/entrepreneurship/sme2chance/) for a detailed description of the initiatives undertaken since 2002 by the Commission to promote a more lenient cultural and legislative environment towards entrepreneurial failure.

<sup>2</sup>Section 2 provides a short synopsis on Chapter 11 and its features. See Stanghellini (2007) for a general overview of bankruptcy law and economics and Brouwer (2006) for a comparative analysis between the United States and Europe on the discipline of reorganization in bankruptcy. Finally, see Franks and Davydenko (2008) for an empirical study of how differences over creditors’ rights among France, UK and Germany

The international financial meltdown triggered in the Fall of 2008 by the failure of major US credit institutions has pushed a number of firms onto the verge of bankruptcy. Standard & Poor's reports that the default rate related to European companies in its speculative-grade category is expected to rise to 11.1% in 2009 and 2010, from 3.2% over the last fifteen years.<sup>3</sup> Clearly, this poses an important challenge to the recently adopted bankruptcy schemes, because a successful restructuring of the distressed companies involved in the crisis is crucial to sparkle a fast process of recovery.

We contribute to the debate on bankruptcy reform by providing a set of results that challenge the wisdom that “soft” bankruptcy codes have necessarily positive effects. Indeed, we show that a lenient procedure may bring about a problem of short-termism in investment decisions.

This paper presents a stylized principal-agent model with repeated moral hazard, in which a cash constrained entrepreneur can choose to undertake either a *short-term* project or a *long-term* project. The short-term project is completed in one period and returns a lower net present value than the long-term project. However, the long-term project requires two periods to be completed and exposes the entrepreneur to the risk of bankruptcy.<sup>4</sup>

Our aim is to compare the impact on investment decisions of a bankruptcy game that tries to replicate the most salient features of a real “soft” code, with respect to a benchmark case in which liquidation follows automatically in a case of insolvency. Bankruptcy is modeled through the implications that it imparts on an entrepreneur's future and, strictly speaking, it consists in a renegotiation game that resembles Chapter 11 in the balance of lenders' and entrepreneur's rights.

The short-termism result is derived in two steps. Firstly, we prove that lenders' behavior is characterized by limited commitment under “soft” bankruptcy. We do this by following a mechanism borrowed from the literature on the “soft budget constraint” problem.<sup>5</sup> If the bankrupt entrepreneur finds new funds to carry on the project during the phase of financial restructuring, existing lenders are tempted to approve the project's continuation and renegotiate the prescription of termination contained in the initial contract. On the one hand, this increases ex-post efficiency because investors improve recovery rates but on the

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insolvency systems have an impact over banks' lending decisions to distressed companies.

<sup>3</sup>See *The Economist*, “Out of Pocket”, December 2008 issue.

<sup>4</sup>In order to make things more concrete, in what follows the short-term project is designed as a risk-free investment, like a government bond. Instead, the long-term project is an investment that may deliver high long-run payoffs at the cost of early failures, like the investments in R&D.

<sup>5</sup>This literature highlights the costs to a principal from the lack of commitment to remain tough with an agent. See the seminal paper by Dewatripont and Maskin (1995) and Kornai et al. (2003).

other hand, it decreases ex-ante efficiency because the prospect of renegotiation raises the agency rent that investors need to bear to induce the right incentives.

Secondly, we show that the problem of limited commitment generates short-termism. Indeed, the higher transfer that lenders need to bear to cope with the repeated moral hazard problem makes the long run project unimplementable without violating entrepreneur's incentives and this induces the same entrepreneur to prefer projects that return immediate results, but that are not subject to the risk of bankruptcy.<sup>6</sup>

The paper contributes to the analysis of bankruptcy presenting three additional results. The first is that the bias towards the achievement of short-term results holds even if the bankrupt entrepreneur can undertake a process of technological restructuring following a bad outcome. More specifically, in the extension with bankruptcy and technological restructuring, we contrast the two conflicting forces triggered by the "soft budget constraint" effect. Firstly, we have the one put forward by Dewatripont and Maskin (1995) and von Thadden (1995), where it is shown that hardening the budget constraint may bring to an end valuable, but slow, projects. Secondly, the one put forward by this paper, where we show that softening the budget constraint also causes an increase of agency costs. The result of this extension is that the investment choice is efficient only if the probability that a low outcome is caused by exogenous adverse shocks is high enough. Otherwise, provided the moral hazard problem is severe enough, the short-termism problem arises.

The second regards the effect of competition on financial markets on the investment choice: in a context with monopoly lending, we show that the short-termism result is further reinforced with respect to the environment with competitive financial markets. In the case with competitive lending, the entrepreneur is able to fully squeeze the net value of the long-term project and therefore, the project is always undertaken if implementable. Instead, the monopoly lender must take into account entrepreneur's agency rent when comparing projects' profitability and as such, rent increases in the "soft" bankruptcy framework to make the long-term project unprofitable, independently from recovery rates.

The third result is that the existence of collateral alleviates the soft-budget constraint problem and facilitates the choice of the long term project by the entrepreneur. Intuitively,

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<sup>6</sup>It has to be remarked that the mechanism by which short-termism arises in this paper is different than the one in Diamond (2004). Indeed, Diamond (2004) shows that in weak legal environments and with multiple lenders, short-term debt is the contract that allows a creditor to minimize the dead weight loss that he would suffer from a run on a borrower by the other lenders. In other words, Diamond (2004) shows that holding the right to neglect refunding, and keep the budget constraint tight, a lender is less exposed to the negative externality imposed by other lenders when these require for an early stage repayment.

collateral rises recovery rates in the event of project's failure and reduces the rent that the entrepreneur can extract by misbehaving.

The model sheds light on a type of costs caused by reorganization in bankruptcy that, so far, have been neglected by the law and economics literature. However, two pieces of empirical evidence support our conclusions. The first, and more important, is due to John et al. (2008), in which it is shown that strong creditor rights induce firms' insiders and managers to choose more valuable investment projects by hampering the opportunities of rent extraction generated by opportunistic conduct.

The second is in a number of empirical analyses that show that risk-premia and short-term lending are positively correlated with bankruptcy law degree of "leniency" (see Blume et al., 1980; Corbett, 1987; Poterba and Summers, 1995; Qian and Strahan, 2007).<sup>7</sup>

The paper proceeds as follows. Section 2 gives a short introduction to Chapter 11, Section 3 compares our findings with those established in related papers and Section 4 presents the main model. In Section 5, we discuss the benchmark case in which the lender can commit to the optimal initial contract with the entrepreneur and liquidate the firm in case of a project's failure, while in Section 6 we relax the assumption of full commitment and study the effects of "soft" bankruptcy. Section 7 proves that the main result carries over even if the entrepreneur is allowed to undertake a process of technological restructuring in bankruptcy. In Section 8, we solve the model under the assumption of monopolistic lending and Section 9 discusses a variant of the main model with collateral. Section 10 discusses the empirical predictions and the policy conclusion of the paper. Finally, Section 11 concludes.

## 2 Chapter 11

In the United States, Chapter 7 and Chapter 11 of the bankruptcy law provide the federal discipline that regulates corporate insolvency procedures. Chapter 7 governs the phase of liquidation, while Chapter 11 governs the process of financial restructuring. They are both carried out under the oversight of specialized bankruptcy courts.

Chapter 11 ultimate target is to protect a bankrupt firm from outsiders' pressure while it is coping with a process of rehabilitation. Chapter 11 prescribes a system of countervailing rights aimed at protecting both creditors' and debtors' interests. On the debtors' side is the provision that allows the entrepreneur to file unilaterally for Chapter 11, at the prospect of potential default. Entry into Chapter 11 opens the Debtor-in-Possession (or DIP) phase,

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<sup>7</sup>See Section 10 for a more detailed discussion on our testable predictions and policy conclusion.

during which the entrepreneur has the right to stop payments to existing investors (automatic stay) and devise a restructuring plan to be submitted to creditors by a given period of time.<sup>8</sup> During the Debtor-In-Possession phase, the entrepreneur can also search for new funds and in order to facilitate this, Chapter 11 prescribes that the investors willing to finance bankrupt firms are privileged in the reimbursement of their claims at the end of the restructuring process - i.e., they can be repaid before (even senior) existing investors.

Creditors have two important rights in Chapter 11: first, they can propose an alternative plan to the entrepreneur's and second, they vote on the restructuring project in a ballot disciplined by a system of qualified majorities.<sup>9</sup> In fact, by rejecting the plan, creditors can reverse the restructuring procedure into a Chapter 7 liquidation process.

In the model, we compare the impact of a variety of renegotiation environments in bankruptcy over ex ante investment choices. More specifically, the main bankruptcy game we will consider is based on Chapter 11 and the rights it grants to contracting parties. Particular emphasis is given to two of them: the right that the entrepreneur has to unilaterally file for bankruptcy, search for new funds and devise a restructuring plan, and the right that lenders have to vote on the same plan.

### 3 Related Literature

Gertner and Scharfstein (1991) has been the first to show how inefficient decisions over bankrupt firms' continuation distort ex ante corporate investment choices. In this literature, however, two papers are particularly close in spirit to this one; Bebchuk (2002) and Acharya and Subramanian (forthcoming). Bebchuk (2002) focuses on how the APR deviations that characterize Chapter 11 proceedings influence equity-holders choice between two investment projects, one riskier than the other. Bebchuk (2002) shows that equity-holders may be tempted to choose the risky project because in failure states they are able to secure a positive rent from Chapter 11 negotiations. However, Bebchuk (2002) implicitly assumes that the creditors are unaware of the type of investment projects available to the equity-holders. Instead, in this paper we assume that a lender can observe and verify the investment plan that the entrepreneur undertakes, and designs the optimal contract as to induce her to choose the most profitable one. Consequently, we derive the investment strategy choice as a function

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<sup>8</sup>The deadline is set by law at 120 days, but the bankruptcy judge can concede extensions.

<sup>9</sup>Creditors vote on the plan by classes of seniority. More specifically, an entire class of claims is deemed to accept a plan if the plan is accepted by creditors that hold at least two-thirds in amount and more than one-half in number. A vote of acceptance by a class binds all creditors in the class.



of the optimal equilibrium contracts and study how the same choice changes with the type of bankruptcy. Acharya and Subramanian (forthcoming) studies how different bankruptcy types impact on firms' decision over innovation and capital structure. The main result of this paper is that firms that operate in an economy with a "soft" bankruptcy procedure are more prone to carry out innovative strategies. This conclusion is driven by income tax and bankruptcy costs, instead in our model it is the costs associated to the limited commitment problem that crucially determine the investment strategy chosen at equilibrium.

An important strand of the economic literature on bankruptcy emphasizes the trade-off between the excessive liquidation caused by "tough" procedures and the excessive continuation generated by "soft" procedures.<sup>10</sup> For example, White (1994) investigates the role of bankruptcy as a filtering device in a model with adverse selection and highlights the way bankruptcy can distort liquidation/continuation decisions. Our paper focuses on the agency costs caused by moral hazard and limited commitment. The costs generated by moral hazard induce the parties to write a contract that prescribes termination in case of project's failure. The problem of limited commitment associated to "soft" procedures, though, weakens this threat and forces the lender to grant a higher monetary transfer in order to induce the right incentives on entrepreneur's side.

This paper is also related to the literature that studies the decision over corporate strategies' horizon. In particular, Dewatripont and Maskin (1995) and von Thadden (1995) investigate the relationship between the "soft budget constraint" problem and investments' horizon, concluding that *hardening the budget constraint may induce short-termism in investment behavior*.<sup>11</sup> In these papers, it is shown that neglecting the refunding of projects that yield a low outcome in the short-term hinders the implementation of both bad projects, and slow, but good, projects that are able to generate very high gains only in the long-run. Clearly, this is not efficient if the higher profitability of long-term projects offsets the losses caused by bad projects. We contribute to this literature by showing that *hardening the budget constraint induces long-termism* because it allows investors to keep the termination threat credible and limit the costs associated with the problem of repeated moral hazard.

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<sup>10</sup>This trade-off has also influenced the debate over the design of the optimal bankruptcy reform. See Hart (1995), chapter 7, for a comprehensive discussion on this topic.

<sup>11</sup>In particular, our model differs from von Thadden (1995) insofar as we assume that the lender can observe the project chosen by the firm but cannot observe first period profits. Moreover, we differ from Baliga and Polak (2004), which also builds on Dewatripont and Maskin (1995) by introducing a problem of moral hazard, because there authors employ a one-shot game to study the choice between monitored and non-monitored loans.

Recent theoretical and empirical contributions show that “soft” bankruptcy procedures foster innovation and entrepreneurship. For example, Acharya and Subramanian (forthcoming) provides empirical evidence on how “soft” codes foster innovation, Biais and Mariotti (2009) develops a model that shows how these procedures produce positive externalities at a general equilibrium level and Landier (2006) proves that “soft” bankruptcy stimulates entrepreneurial initiative. More specifically, Landier (2006) develops a model where the attitude of capital markets towards failure is endogenous: entrepreneurship depends on the cost of funding, which in turn depends on markets’ expectations over failed entrepreneurs’ ability. Landier (2006) shows that “soft” bankruptcy rules stimulate entrepreneurship because they grant a complete debt relief to the failed entrepreneur and reduce the cost of capital necessary to start new projects. With respect to the analysis in Landier (2006), we let the cost of funding depend on the severity of the moral hazard problem, which depends on bankruptcy law.

Finally, the main result of the paper follows from the assumption for which parties can renegotiate the initial contract through bankruptcy: this weakens ex ante incentives but alleviates ex post efficiency loss. Therefore, like in Bolton and Scharfstein (1996), the main focus is on the renegotiation game that is carried out between lender and entrepreneur. However, the aim of Bolton and Scharfstein (1996) is to determine the optimal number of creditors that is able to minimize the trade-off between entrepreneur’s ex ante incentives to default strategically and the ex post efficiency costs generated by liquidation. Instead, in this paper we are more concerned about the impact of renegotiation on firm’s investment plans.

## 4 The Model

The model analyses a financing game in an environment characterized by asymmetric information and entrepreneur’s limited liability. There are two classes of risk-neutral agents in our economy: a cash constrained entrepreneur (or borrower, she) and competing lenders.<sup>12</sup> In what follows, we assume that each entrepreneur obtains funding from a single lender (or investor, he) and focus on a representative entrepreneur-lender pair. Moreover, market interest rates are normalized to zero.

The entrepreneur decides the time horizon of the investment and this decision is observed

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<sup>12</sup>In fact, what follows also applies to managerial firms in which managers’ interests are perfectly aligned with equity-holders’.

and verified by the lender. More specifically, the entrepreneur can choose between two projects: a short-term project ( $S$ ) and a long-term project ( $L$ ). This choice influences firm's expected revenues in the following way. The short-term project is modeled as an outside option that returns a net payoff of  $\Pi_S > 0$ .<sup>13</sup> The long-term project extends over up to two periods, it requires an outlay of  $I > 0$  to be started and a further infusion of  $\hat{I} > 0$  to be completed. In the first period, project  $L$  delivers a payoff equal to  $\Pi > 0$  in the case of success, and zero in the case of failure. Finally, in the second period, the project generates an expected return equal to  $\hat{\Pi} > 0$  independently from first period outcome.

The profitability of the long-term project is subject to two problems of asymmetric information. Firstly, the entrepreneur must decide in each period whether to exert effort or shirk. In the first period, the moral hazard problem is designed as in Holmström-Tirole (1997). More specifically, we assume that if the entrepreneur puts in effort, she would succeed with certainty and if she shirks, she would fail with certainty but gain private benefits  $B > 0$ .<sup>14</sup> In the second period, the moral hazard problem is designed in a reduced form: the entrepreneur requires the payment of a reward at least equal to  $\hat{B} > 0$  to put in effort.

Secondly, we assume that the entrepreneur privately observes the project's first period outcome. This assumption follows Bolton and Scharfstein (1990) and is equivalent to assuming that the lender needs to bear an infinite cost to observe the true state. The main implication of this hypothesis is that long-term contingent contracts are not feasible in this setting. In other words, we are limiting the scope of our analysis to short-term contracts, in which refunding decisions depend on the results reported at the end of the first period by the entrepreneur.<sup>15</sup>

Time-line and cash flow of the game are given in Figure 1.

[FIGURE 1 ABOUT HERE]

The entrepreneur holds all the bargaining power at the contracting stage: she makes a take-it-or-leave-it offer to the lender that specifies the project she wants to carry out and

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<sup>13</sup> $\Pi_S$  corresponds to the net surplus yielded by project  $S$  to the agent that holds the bargaining power in the contracting phase. This assumption allows to greatly simplify the analysis. However, what is sufficient for the main result to hold is that project  $S$  is not subject to the risk of bankruptcy.

<sup>14</sup>This assumption allows to deliver a sharper result than with intermediate probabilities of success (failure). We would like to remark that the nature of the results would not change assuming that the probability of success (failure) is positive and into the unit interval.

<sup>15</sup>It is important to remark that here project's payoff is function of a decision over effort provision, therefore, it is not randomly determined. This implies that our game is not a signaling game of the Gale and Hellwig (1989) type.

the contract that would implement it.<sup>16</sup> If the lender accepts the offer, he provides initial funding and the project is started. The class of contractual mechanisms we focus on are composed by two instruments: a per period repayment from the entrepreneur to the lender and project's continuation decisions. The repayment required in the first period is denoted by  $R$ , while the transfer required in the second period is denoted by  $\hat{R}$ . Lenders' decisions over project continuation are denoted by  $\zeta_j = \{0, 1\}$ , with  $j = \Pi, 0$ , and depend on first period revealed payoff: if the entrepreneur reports  $\Pi$  (zero), the project is refunded when  $\zeta_\Pi = 1$  ( $\zeta_0 = 1$ ), terminated otherwise ( $\zeta_j = 0$ , with  $j = \Pi, 0$ ). Entry into bankruptcy takes place when the entrepreneur does not repay as much as is required in the contract and the implications for the firm depend on bankruptcy code. In Section 4.1, we will be more specific on how the game develops in bankruptcy states.

We introduce four assumptions on the parameters of the model.

*Assumption 1.*

- i.*  $\Pi > B$ ;
- ii.*  $\Pi > I$ ;
- iii.*  $\hat{\Pi} - \hat{I} - \hat{B} > 0$ .
- iv.*  $\hat{\Pi} - \hat{I} - I > 0$ .

Assumption (1.i) implies that, in the first period, entrepreneur's choice over profit's revelation is more binding than the one related to effort provision, Assumption (1.ii) implies that the long-term project has positive net present value in the first period, Assumption (1.iii) implies that the long-term project has positive pledgeable income in the second period,<sup>17</sup> and Assumption (1.iv) implies that the truth telling problem is not relevant in the benchmark case without bankruptcy.

The optimal mechanism that implements strategy  $L$  is found by solving, by backward induction, for the sequential incentive problems in  $t = 2$  and  $t = 1$ . The equilibrium concept we shall employ is the Subgame Perfect Nash Equilibrium (SPE).

## 4.1 The Bankruptcy Game

Renegotiation takes place in bankruptcy and is compliant to bankruptcy code's prescriptions. This implies that bankrupt entrepreneurs are allowed to renegotiate the termination clause only under the mechanisms provided by the law. In particular, in insolvency states,

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<sup>16</sup>Clearly, the way we model project  $S$  implies that the relative contract just specifies how  $\Pi_S$  is split.

<sup>17</sup>By pledgeable income we mean the surplus delivered by the project net of the cost related with investment allotment and private benefits.

the following *bankruptcy game* takes place.

1. The entrepreneur searches for new funds on competitive financial markets.
2. If the entrepreneur finds a new lender, this lender makes her an offer.
3. In the case of offer acceptance, the first period lender (or old lender) must decide either to agree on the continuation plan or reject it. More specifically, such a decision is the outcome of an ultimatum game in which the old lender has all the bargaining power and makes a take-it-or-leave-it offer to the agent. This offer specifies the payoff that the lender requires to allow project continuation and is denoted by  $\hat{r}$ .
4. If the entrepreneur accepts the old lender's offer, the firm continues its activity and the second period time structure is the same as in case of continuation out of bankruptcy. Otherwise, the firm is shut down and the entrepreneur is dismissed.

In bankruptcy, both the second period effort decision and the the project's cash flow distribution are modeled as out of bankruptcy.

Two points must be stressed. Firstly, the lender that provides new liquidity in the second stage of the renegotiation game must not be necessarily different from the first period one. Indeed, in both cases the model would deliver the same type of results.<sup>18</sup>

Secondly, the choice to structure the renegotiation phase as an ultimatum game implies that the allocation of the bargaining power determines the equilibrium outcomes. We assume that the old lender has all the bargaining power in bankruptcy. This hypothesis may seem limiting because it does not capture the interactions that take place among creditors and debtors under the supervision of the bankruptcy judge in a real Chapter 11. However, weakening old lender's bargaining power would only reinforce our conclusions. In fact, the model shows that even when the initial lender holds the power to decide whether to enforce the contract or not (asking for a huge value of  $\hat{r}$ , for instance), he may eventually accept renegotiation.<sup>19</sup>

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<sup>18</sup>It is worth noticing that the empirical evidence provided by Daihya et al. (2003) on Chapter 11 Debtor-In-Possession funding contracts confirms that bankrupt firms do receive money from both investors with whom they already have a lending relationship and new investors.

<sup>19</sup>In relation to this feature of the game, it is interesting to remark that during Chapter 11 voting phase the bankruptcy judge can "cram-down" a restructuring plan, even against old lender's will, if she/he believes that the plan preserves firm's value as a going concern. Explicitly introducing this into the renegotiation game would further exacerbate the "soft-budget constraint problem" that we highlight, since it would increase entrepreneur's outside option during negotiations.

## 4.2 First Best

Analyze first the scenario in which the entrepreneur is not cash constrained and there is no problem of moral hazard. We assume that in these circumstances the long-term project generates a net present value higher than the one attached to the short-term project and therefore determines the value of the firm in the first best scenario.

$$\Pi - I + \hat{\Pi} - \hat{I} > \Pi_S. \quad (FB)$$

In what follows, it is first presented how the contracting game changes when the moral hazard problems are introduced into the analysis and then when the problem of limited commitment is accounted for.

## 5 Optimal Contract with Full Commitment

In this section, we derive the equilibrium contract that the lender may want to propose to the entrepreneur under the assumption of full commitment. With respect to the first best scenario, we introduce the problem of repeated moral hazard. Therefore, in this setting, the constraints related to an entrepreneur's private decisions on effort provision and payoff revelation must be taken into account. Nevertheless, thanks to full commitment, the bankruptcy code does not affect the investment strategy choice because at the interim stage, no matter what the law prescribes, the lender sticks to the contract signed at the outset and imposes liquidation on the firm.

Lemma 1 presents the equilibrium of the contracting game.

### Lemma 1.

Denote by  $\mathcal{C}^{FC}$  the equilibrium contract that implements the long-term investment strategy  $L$  under full commitment.  $\mathcal{C}^{FC}$  specifies that:

$$\mathcal{C}^{FC} \equiv \{R = I, \hat{R} = \hat{I}\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 0\}.$$

Consequently, borrower's utility under project  $L$  at equilibrium, denoted  $U^{FC}$ , is:

$$U^{FC} = \Pi - I + \hat{\Pi} - \hat{I} > 0. \quad (1)$$

The lender breaks even in expectation.

**Proof.** See Appendix A.

Notice that  $\mathcal{C}^{FC}$  induces the entrepreneur to put in effort in both periods and truthfully reveal first period outcome. Also,  $\mathcal{C}^{FC}$  can be implemented by a sequence of short-term standard debt contracts that require the repayment of a fixed amount at the end of each period.

Clearly, the choice of the project depends on the comparison of entrepreneur's utility under  $S$  and  $L$ .

**Proposition 1.**

*Under full commitment, the entrepreneur chooses the long-term project  $L$ . Therefore, the entrepreneur offers  $\mathcal{C}^{FC}$  to the lender and project  $L$  is started if the lender accepts and provides  $I$ .*

To begin with, notice that the contract specifies that if the entrepreneur does not report  $\Pi$  the firm is not refunded ( $\zeta_0 = 0$ ) and is put in bankruptcy ( $0 < R$ ). In other words, even in a setting with positive second period expected value, it is optimal to terminate the project and push the entrepreneur to bankruptcy. Moreover, the assumption of competitive financial markets implies that the entrepreneur is able to squeeze all the value of project  $L$ , hence the first best is attained. Finally, the profitability of the long-term project is not affected by bankruptcy because renegotiation is not allowed under full commitment.

## 6 Optimal Contract with Limited Commitment

In this section, we present how the contracting game changes under the assumption of limited commitment. The departure from full commitment implies that lender's ability to enforce the optimal contract depends on bankruptcy law. If the procedure is "soft", the bankrupt entrepreneur has the right to search for new lenders and the old lender has the power to permit or prevent continuation. In this section, we show that he allows continuation because this makes recovery rates improve. Consequently, a tension arises between ex-post and ex-ante efficiency, which determines the resulting investment strategy choice.

**Proposition 2.**

*Under limited commitment, two scenarios can arise, depending on the value of project  $L$*

expected pledgeable income in the second period:

- i. If  $\widehat{\Pi} - \widehat{I} - \widehat{B} < I$ , project  $S$  is chosen by the entrepreneur, the lender breaks even and the entrepreneur takes  $\Pi_S$ . Finally, project  $S$  is implemented if the lender accepts the offer.
- ii. If  $\widehat{\Pi} - \widehat{I} - \widehat{B} \geq I$ , the entrepreneur offers  $\mathcal{C}^{LC}$  to the lender.

$$\mathcal{C}^{LC} \equiv \{R = I, \widehat{R} = \widehat{I}, \hat{r} = I\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 1\}.$$

Borrower's utility under  $\mathcal{C}^{LC}$ , denoted  $U^{LC}$ , is:

$$U^{LC} = \Pi - I + \widehat{\Pi} - \widehat{I} > 0.$$

The lender breaks even in expectation. Finally, if the lender accepts the offer, project  $L$  is implemented.

**Proof.** See Appendix B.

This proposition shows that “soft” bankruptcy procedures may cause a bias toward short-termism in firm's investment behavior. The intuition for this result is as follows. On the one hand, a lenient procedure reduces the instruments available to cope with entrepreneur's moral hazard. On the other hand, it allows for an improvement in recovery rates in the case of first period insolvency. Indeed, once the assumption of full commitment is relaxed, we show that it is not rational to the old lender, at the interim stage, to refuse any finite rent from renegotiation, even if this comes at the cost of loosening the refunding decisions.

The bankruptcy game that we employ reverses the bargaining power allocation with respect to the initial contracting stage, in which it is the entrepreneur to hold all the bargaining power. However, this assumption does not reinforce our result. If the entrepreneur was to hold all monopoly power at the renegotiation stage, then the equilibrium of the investment game would never feature the choice of the long-term project because the entrepreneur would squeeze project's net present value in full and the lender would never retrieve  $I$  through the recovery rates.

Our main finding is that, unless the lender is able to recover in full the initial outlay, the exacerbation of the agency costs caused by the relaxation of the termination threat is not offset by the transfer  $\hat{r}$  required by the lender to permit continuation in bankruptcy. In other words, the entrepreneur would always have incentive to divert first period profits and



project  $L$  would not be profitable from the lenders' viewpoint. This result is supported by the *empirical evidence* in Franks and Sussman (2005). Franks and Sussman (2005) shows that in the UK, where bankruptcy law is relatively "tough" and SMEs' credit exposure is rather concentrated, senior lenders commit to a severe stance towards debt renegotiations, and it is argued that this is done to avoid strategic default. Similarly, we show that the lender is more likely to keep a tough stance against debt renegotiation in bankruptcy when recovery rates do not allow the recouping in full of the outstanding liability.

The model's result that tightening the termination threat allows for the implementation of more valuable projects is supported by the findings of the empirical analysis of John et al. (2008). Indeed, John et al. (2008) claims that strong creditor protection induces firms' insiders and managers to choose more valuable investment strategies by hampering their rent extraction behavior. This conclusion, and the intuition behind, is consistent with our conclusions.

Further evidence to the short-termism result is in the surveys that look at financial conditions set by investors at the contracting stage (see Blume et al., 1980; Corbett, 1987; Poterba and Summers, 1995). These studies show that, in Anglo-Saxon countries, the cut-off rates required by investors are bigger, and the lending horizon is shorter, than in Continental Europe, bearing witness to the greater pressure exerted towards the achievement of short-term outcomes. Finally, Qian and Strahan (2007) shows that stronger creditor protection is correlated with bigger interest rates and longer term financing.

## 7 Bankruptcy and Technological Restructuring

The model in Section 4 allows us to present a sharp result, but does not take into account that restructuring in bankruptcy may give a second chance to ventures in difficulties. In particular, we forego the impact that a technological restructuring process would impart on firm's value. This is an important feature of Chapter 11 and it is particularly important if failure is caused by exogenous circumstances, like an adverse shock.

In this extension, we design the investment game to give the bankrupt entrepreneur the power to re-establish the venture's profitability following a first period project failure or after a negative shock that fully depletes first period project value. In this way, we contrast the two conflicting forces triggered by the "soft budget constraint" effect: the one put forward by Dewatripont and Maskin (1995) and von Thadden (1995), where it is shown that *hardening* the budget constraint may bring to an end valuable, but slow, projects and the one put

forward by this paper, where we show that *softening* the budget constraint also causes the increase of agency costs.

The goal of this section is to compare the results of a bankruptcy game with technological restructuring to the case in which bankruptcy is not allowed. More specifically, we want to understand to what extent the chances for the long-term strategy to be selected at equilibrium increase with bankruptcy and restructuring.

The outcome of this extension is a trade-off in which, on the one hand, restructuring enables the attainment of a higher net value of the long-term project but, on the other hand, the “soft budget constraint” problem puts at risk project’s implementation with respect to the case in which renegotiation is not allowed.

We modify the structure of both the investment game and the bankruptcy game with respect to Section 4. Firstly, we assume that the long-term project is subject to a shock that may spoil its value and that this shock may happen with probability  $1 - \sigma$ .<sup>20</sup>

Secondly, we assume that in the second period the expected payoff returned by the long-term project is perfectly correlated with the outcome of the first period, equal to  $\hat{\Pi}$  in the case of success and zero in the case of a nil first period outcome. However, if permitted by bankruptcy law, the entrepreneur undertakes a restructuring process that increases the payoff of the project to  $\hat{\Pi}$  after a negative shock or a first period project failure. The restructuring process succeeds with certainty and its outcome is publicly observable.<sup>21</sup>

Thirdly, in the framework with bankruptcy and restructuring, we follow the approach of the *costly state verification* literature assuming that the lender can perfectly observe the outcome of the project in the first period, by sending the entrepreneur to bankruptcy and paying a fixed cost  $K$ .<sup>22</sup> In other words, in the spirit of Gale and Hellwig (1985), we are relaxing the assumption for which the true state is observable at an infinite cost. Therefore, in the case with bankruptcy and restructuring, the contract specifies a decision

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<sup>20</sup>This hypothesis allows for the enrichment of the analysis in an interesting fashion. Indeed, in absence of such shock, restructuring would be feasible only after first period failure, which, given the moral hazard problem design of Section 4, happens only in case of first period shirking. This means that restructuring would just increase the rents attached to continuation in bankruptcy and make the long-term project even less valuable in the case of renegotiation in bankruptcy.

<sup>21</sup>Here we are assuming that the restructuring project does not require any implementation cost and this has two implications: the first is that the entrepreneur is always willing to undertake restructuring and the second is that the payoff of the restructured project is the same as following first period success. We would like to remark that introducing a restructuring cost does not change the nature of the results we present in the following of this section.

<sup>22</sup>Also, the lender can observe whether the entrepreneur has been hit by the shock.

rule, denoted by  $p_j \in \{0, 1\}$ , with  $j = \Pi, 0$ , according to which the firm can be put in bankruptcy and the project's payoff verified, depending on the first period revealed outcome. Moreover, the contract defines the payments required in bankruptcy -  $R_\Pi^b$  and  $R_0^b$ , and the payments required out of bankruptcy -  $R_\Pi$  and  $R_0$ . Finally, the introduction of the costly state verification assumption implies that we need to impose that parties commit to the bankruptcy policy specified in the contract, because otherwise they would never be willing to sink the true state disclosure cost  $K$  ex post.<sup>23</sup> However, we maintain the same stance as in the model of Section 4 by assuming that the lender cannot commit to the refunding decision and repayment ( $\hat{r}$ ) in project's failure state, so that these will be determined by the bankruptcy game.<sup>24</sup>

In particular, the new timing of the bankruptcy game is as follows:

1. *The lender observes the true outcome at cost  $K$ .*
2. The entrepreneur searches for new funds on competitive financial markets.
3. If the entrepreneur finds a new lender, this lender makes her an offer.
4. *In case of offer acceptance, the entrepreneur undertakes the technological restructuring process.*
5. The old lender must decide either to agree to the continuation plan or reject it. The old lender and the entrepreneur play an ultimatum game in which the former has all the bargaining power and makes a take-it-or-leave-it offer to the firm. Such an offer specifies the payoff that he requires to allow the project's continuation, indexed  $\hat{r}_j$ , with  $j = \Pi, 0$ .
6. If the entrepreneur accepts the old lender's offer, the firm continues its activity and the second period time structure is the same as in the case of continuation out of bankruptcy. Otherwise, the firm is shut down and the entrepreneur is dismissed.

Second period effort decision in bankruptcy is modeled as out of bankruptcy, while the new payoff distribution is in Figure 2. Finally, the parametric hypotheses of Assumption 1 also hold in this section. However, we introduce Assumption 2 below.

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<sup>23</sup>Indeed, as remarked by Bolton and Dewatripont (2005), if the entrepreneur expects the policy to be carried out, she always reports the cash flow's exact realization. In turn, the lender, anticipating that the truth is always communicated, would not have incentive to undertake the verification policy.

<sup>24</sup>In fact, were the lender able to commit on the value of the payments in bankruptcy,  $\hat{r}$ , then he could differentiate the transfer required in case of a shock from the case of shirking and increase efficiency without violating incentives.

*Assumption 2.*

$$\hat{\Pi} - \hat{I} - \hat{B} > K.$$

[FIGURE 2 ABOUT HERE]

Assumption 2 introduces an upper bound to verification costs,  $K$ , and it implies that long run project's second period expected pledgeable income is not depleted after paying  $K$ .

## 7.1 Optimal Contract without Bankruptcy and Technological Restructuring

In this section we derive the contract that lender and entrepreneur sign when bankruptcy (and technological restructuring) is not allowed: this framework corresponds to the one in which parties cannot renegotiate the original deal at the interim stage. Lemma 2 presents the equilibrium of the contracting game.

### Lemma 2.

Denote by  $\mathcal{C}^{NR}$  the equilibrium contract that implements the long-term investment strategy  $L$  in absence of bankruptcy and technological restructuring.  $\mathcal{C}^{NR}$  specifies that:

$$\mathcal{C}^{NR} \equiv \{R = R^{NR} \equiv I/\sigma, \hat{R} = \hat{I}\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 0\}.$$

$\mathcal{C}^{NR}$  can be implemented if first period limited liability,

$$\Pi \geq I/\sigma,$$

The incentive constraint related to effort provision,

$$\sigma\Pi - I + \sigma(\hat{\Pi} - \hat{I}) \geq B, \tag{2}$$

the truth telling constraint,

$$\hat{\Pi} - \hat{I} - I/\sigma \geq 0,$$

are satisfied. Then, borrower's utility, denoted  $U^{NR}$ , is equal to:

$$U^{NR} = \sigma\Pi - I + \sigma(\hat{\Pi} - \hat{I}).$$

and the lender breaks even in expectation. Finally, long-term project  $L$  is chosen at equilibrium if:

$$\sigma\Pi - I + \sigma(\widehat{\Pi} - \widehat{I}) \geq \Pi_S. \quad (3)$$

**Proof.** See Appendix C.

The risk of a negative shock increases the repayment required in the first period by the lender, and this has two implications. Firstly, first period limited liability, the incentive constraint and the truth telling constraint may not hold. Secondly, the value generated by the long-term project is smaller than in the full commitment case of Section 5.<sup>25</sup>

## 7.2 Optimal Contract with Bankruptcy and Technological Restructuring

If bankruptcy allows the entrepreneur to restructure the firm in case of an adverse shock or a first period failure, there are two conflicting forces that influence the contracting game outcome and project choice. On the one hand, as shown in Section 6, renegotiation in bankruptcy increases the agency costs attached to the implementation of project  $L$ . On the other hand, technological restructuring can raise the value of the same project and make it more profitable to the entrepreneur. Lemma 3 presents the optimal contract and the conditions that determine project choice in this framework.

### Lemma 3.

In a setting with bankruptcy and technological restructuring, two cases must be distinguished.

- (i) If  $\widehat{\Pi} - \widehat{I} - \widehat{B} - K < I$ , recovery rates are not enough to recoup the initial investment's value. The optimal contract in this case, denoted by  $\mathcal{C}^R$ , specifies that:

$$\mathcal{C}^R \equiv \left\{ R_{\Pi} = R^R \equiv \frac{I - (\widehat{\Pi} - \widehat{I} - \widehat{B} - K)(1 - \sigma)}{\sigma}, R_{\Pi}^b = R_0^b = R_0 = 0, \widehat{R} = \widehat{I}, \right. \\ \left. \{p_{\Pi} = 0, p_0 = 1\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 1\}, \quad \{\hat{r}_{\Pi} = 0, \hat{r}_0 = \widehat{\Pi} - \widehat{I} - \widehat{B}\} \right\}.$$

$\mathcal{C}^R$  can be implemented if first period limited liability

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<sup>25</sup>Compare expressions (1) and (3).

$$\Pi \geq \frac{I - (\widehat{\Pi} - \widehat{I} - \widehat{B} - K)(1 - \sigma)}{\sigma},$$

the incentive constraint related to effort provision,

$$\sigma\Pi - I + (\widehat{\Pi} - \widehat{I} - \widehat{B}) - (1 - \sigma)K \geq B, \quad (4)$$

are satisfied. Then, borrower's utility, denoted  $U^R$ , is equal to:

$$U^R = \sigma\Pi - I + (\widehat{\Pi} - \widehat{I}) - K(1 - \sigma),$$

and the lender breaks even in expectation. Finally, the long-term project  $L$  is chosen at equilibrium if:

$$\sigma\Pi - I + (\widehat{\Pi} - \widehat{I}) - K(1 - \sigma) \geq \Pi_S. \quad (5)$$

(ii) If  $\widehat{\Pi} - \widehat{I} - \widehat{B} - K \geq I$ , recovery rates allow for the recouping of the initial investment's value. In this case, the optimal contract,  $\mathcal{C}_s^R$ , specifies that:

$$\mathcal{C}_s^R \equiv \{R_\Pi = I, R_\Pi^b = R_0 = R_0^b = 0, \widehat{R} = \widehat{I}\},$$

$$\{p_\Pi = 0, p_0 = 1\}, \quad \{\zeta_\Pi = 1, \zeta_0 = 1\}, \quad \{\hat{r}_\Pi = 0, \hat{r}_0 = I + K\}.$$

$\mathcal{C}_s^R$  can be implemented if the incentive constraint related to effort provision,

$$\sigma(\Pi + K) \geq B,$$

is satisfied. Then, borrower's utility, denoted  $U_s^R$ , is equal to:

$$U_s^R = \sigma\Pi - (1 - \sigma)K + (\widehat{\Pi} - \widehat{I} - I),$$

and the lender breaks even in expectation. Finally, long-term project  $L$  is chosen at equilibrium if:

$$\sigma\Pi - (1 - \sigma)K + (\widehat{\Pi} - \widehat{I} - I) \geq \Pi_S.$$

**Proof.** See Appendix D.

Focusing on the case in which  $\hat{\Pi} - \hat{I} - \hat{B} - K < I$ ,<sup>26</sup> the optimal contract specifies putting the entrepreneur in bankruptcy and verify the project's outcome only if a nil payoff is reported ( $p_0 = 1$ ,  $p_{\Pi} = 0$ ). Moreover, the entrepreneur never lies at equilibrium, as she communicates to have zero cash only if she is hit by a negative shock.

### 7.3 Bankruptcy, Technological Restructuring and Short-termism

Proposition 3 compares the main features of  $\mathcal{C}^{NR}$  and  $\mathcal{C}^R$ , the optimal contracts presented in Lemma 2 and Lemma 3, respectively.<sup>27</sup> This allows us to study how the short-termism result presented in Proposition 2 fares when the entrepreneur is entitled to implement a project of technological reorganization in bankruptcy.

**Proposition 3.**

*With respect to the case without bankruptcy, bankruptcy with technological restructuring has three effects:*

- (i) *The utility of the entrepreneur increases,  $U^R > U^{NR}$ .*
- (ii) *The contractual payment required in the first period decreases,  $R^R < R^{NR}$ .*
- (iii) *There exists a threshold  $\bar{\sigma} < 1$  such that:*

$$\forall \quad \sigma > \bar{\sigma} \equiv \frac{\hat{\Pi} - \hat{I} - \hat{B} - K}{\hat{\Pi} - \hat{I} - K}$$

*The incentive constraint related to effort provision is more binding.*

A trade off emerges at equilibrium. The main benefits of bankruptcy and restructuring are two. The first is that the value of the long-term project increases at equilibrium and this raises the chances of it being chosen by the entrepreneur. The second is that the first period transfer required by the lender is smaller, because he takes into account that in bankruptcy he will extract a positive rent from the second period (through the recovery rates). Consequently,  $(LL_1)$  is more likely to hold under bankruptcy.<sup>28</sup>

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<sup>26</sup>We choose to discuss this case in more detail because it is the one in which the short-termism result arises in the main model (see Proposition 2).

<sup>27</sup>Again, notice that we are restricting our attention to the results under  $\hat{r}_0 < I + K$ .

<sup>28</sup>A third benefit associated to bankruptcy is that the entrepreneur never lies along the equilibrium path,

However, comparing the expressions of the incentive conditions related to the effort choice evaluated at the optimal contracts,<sup>29</sup> it emerges that, for high values of  $\sigma$ , such constraint is more binding in the case with bankruptcy and restructuring. In other words, when a nil outcome is less likely to be caused by unfortunate events, that is, if  $(1 - \sigma) < (1 - \bar{\sigma})$ , avoiding a “soft” stance in bankruptcy allows for the improvement of entrepreneur’s incentives.

**Example.** We now construct a simple example putting Proposition 3 at work: more specifically, we provide a framework in which the trade-off between the conflicting forces highlighted above can lead to inefficient investment decisions.

First of all, the set of critical values of sigma at which the relevant conditions in Lemma 2 and Lemma 3 hold are pinned down.

The values that satisfy the first period limited liability, incentive constraint and truth-telling constraint in the case without bankruptcy, denoted respectively by  $\sigma_{LL}^{NR}$ ,  $\sigma_{IC}^{NR}$ ,  $\sigma_{TT}^{NR}$ , are given in what follows:

$$\sigma_{LL}^{NR} \equiv \frac{I}{\Pi} \quad \sigma_{TT}^{NR} \equiv \frac{I}{\widehat{\Pi} - \widehat{I}} \quad \sigma_{IC}^{NR} \equiv \frac{B + I}{\widehat{\Pi} - \widehat{I} + \Pi}$$

In particular, if  $\sigma \geq \max\{\sigma_{LL}^{NR}, \sigma_{IC}^{NR}, \sigma_{TT}^{NR}\}$  then the long-term project can be undertaken in the case without bankruptcy.

Instead, the values that satisfy the first period limited liability and incentive constraint in the case with bankruptcy and restructuring, denoted respectively by  $\sigma_{LL}^R$  and  $\sigma_{IC}^R$ , are given in what follows:

$$\sigma_{LL}^R \equiv \frac{I - (\widehat{\Pi} - \widehat{I} - \widehat{B} - K)}{\Pi - (\widehat{\Pi} - \widehat{I} - \widehat{B} - K)} \quad \sigma_{IC}^R \equiv \frac{B + I - (\widehat{\Pi} - \widehat{I} - \widehat{B} - K)}{\Pi + K}$$

In this case, project  $L$  can be undertaken if  $\sigma \geq \max\{\sigma_{LL}^R, \sigma_{IC}^R\}$ .

Without loss of generality, we introduce the following restrictions on the parameters of the model:

$$(a) \quad \widehat{\Pi} - \widehat{I} = \Pi = 2I \quad (b) \quad B = \widehat{B} \quad (c) \quad \sigma > 1/2$$

Restriction (a) implies that that the expected payoff of the project in the second period is bigger than that of the first period. This is equivalent to assuming that project  $L$  is able to

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while in the case without bankruptcy this happens only if the truth telling condition is satisfied.

<sup>29</sup>Compare conditions (2) and (4).



generate very high gains only in the long-term. Restriction (b) implies that the moral hazard problem is equally severe in the first and in the second period. Restriction (c) introduces an upper bound to the probability of being hit by an adverse shock, equal to  $1 - \sigma$ . Moreover, in this setting, Assumption 2 requires that  $\Pi - B - K > 0$ . Then the following result holds.

*Corollary 1.*

If  $2B > \Pi > 4B/3$ , then bankruptcy with technological restructuring reduces the scope for the implementation of the long-term project,  $L$ .

**Proof.** See Appendix E.

Corollary 1 shows that the short-termism result holds in this example provided the moral hazard problem is severe enough and the probability of the adverse shock is low enough. Indeed, under these conditions, in a non-empty range of values of  $\sigma$ , project  $L$  cannot be implemented in the framework with bankruptcy and technological restructuring, but it can be undertaken in the framework without bankruptcy. Like in the benchmark model of Section 4, short-termism is caused by the exacerbation of the repeated agency problem.

## 8 Monopoly Lender

In this section, we present the way in which the results of the model in Section 4 carry on in a framework with a monopoly lender. In other words, we now assume that there is no competition on financial markets in the first period, so that the lender is a monopolist to the borrower. Even though this hypothesis is at odds with a major part of the corporate finance literature, this case has a policy relevance because it is consistent with the financial markets' competitive environments of countries like Germany, Italy and the UK, where banks hold a strong bargaining power vis-à-vis firms.<sup>30</sup>

The twist we introduce with respect to the set-up in Section 4 consists of assuming that it

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<sup>30</sup>With particular regard to the UK, this section is able to study the results of a renegotiation environment analogous to the one that characterizes the London Approach, a widespread practice adopted by British firms' management to implement the process of debt reorganization with creditors (typically big banks) out of the court. The London Approach consists in informal negotiations between a distressed entrepreneur and her lenders and it develops in two distinct phases that closely resemble a Chapter 11: in the first, a consortium of investors agree on a "standstill" that relieves the entrepreneur from the obligation to pay back her debts and in the second parties negotiate and implement a plan of financial restructuring.

is the first period lender who holds all the bargaining power and makes a take-it-or-leave-it offer to the entrepreneur at the contracting game stage. The offer consists of a contract that specifies per period expected repayments, termination decisions and type of investment project. The reversal of the bargaining power also implies that the lender squeezes all of the net value of project  $S$ ,  $\Pi_S$ . Finally, notice that, in bankruptcy, the entrepreneur has access to competitive financial markets when searching for funding in the second period, as in the game of Section 4.1.<sup>31</sup>

The result of this extension is analogous to the one with competitive financial markets, even if at the cost of imposing one further assumption on the parameters of the model.

*Assumption 3.*

$$\Pi > \widehat{B} > I.$$

Assumption 3 implies that the payment required at the end of the first period by the equilibrium contract does not violate the first period limited liability constraint, but is bigger than the initial investment cost,  $I$ , thus making bankruptcy a real concern. In the following, we solve for the optimal contracts under full and limited commitment using Assumption 1 and Assumption 3.

## 8.1 Optimal Contract with Full Commitment

Lemma 4 presents the equilibrium project choice under the hypothesis of *full commitment*.

**Lemma 4.**

Denote by  $\mathcal{C}^{FC,m}$  the equilibrium contract that implements the long-term investment strategy  $L$  under full commitment and monopolistic lending.  $\mathcal{C}^{FC,m}$  specifies that:

$$\mathcal{C}^{FC,m} \equiv \{R = \widehat{B}, \widehat{R} = \widehat{\Pi} - \widehat{B}\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 0\}.$$

At  $\mathcal{C}^{FC,m}$ , lender's utility, denoted  $V^{FC,m}$ , is equal to:

$$V^{FC,m} = \widehat{\Pi} - \widehat{I} - I > 0.$$

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<sup>31</sup>In this way we replicate Dewatripont and Maskin (1995), who studies a funding game in which first period lender has full bargaining power at the contracting and renegotiation stage, while creditors intervening at the interim stage are left with zero expected surplus.

Entrepreneur's utility,  $U^{FC,m}$ , is equal to  $\Pi$ . Finally, the lender offers  $\mathcal{C}^{FC,m}$  to the entrepreneur if and only if:

$$V^{FC,m} = \hat{\Pi} - \hat{I} - I \geq \Pi_S. \quad (6)$$

The project is started if the entrepreneur accepts.

**Proof.** See Appendix F.

In this framework, first and second period transfers to the lender increase with respect to the case with competitive financial markets. Moreover, because of the repeated moral hazard problem, the value generated by project  $L$  to the lender is smaller than in the first best. Consequently, while under competitive financial markets and full commitment project  $L$  is always chosen by the firm, here it is started only if condition (6) holds. In other words, the long-term project may not be undertaken, even when it is implementable, when implementation becomes too costly. The rationale for this result is as follows. In Section 4, the entrepreneur holds all the bargaining power and therefore, she is able to fully squeeze the net value of the long-term project. Instead, here the lender must take into account entrepreneur's agency rent and this increases in the "soft" bankruptcy framework.

## 8.2 Optimal Contract with Limited Commitment

Under the hypothesis of *limited commitment*, we study how the possibility to renegotiate the contract in an environment characterized by the bankruptcy game presented in Section 4.1 affects project's choice.

### Proposition 4.

*Under limited commitment and monopolistic lending, long run project  $L$  cannot be implemented without violating entrepreneur's incentives.*

**Proof.** See Appendix G.

The relaxation of the disciplining role imparted by the refunding decisions, and the consequent increase of the reward necessary to induce the right incentives, implies that the entrepreneur would always have incentive to divert first period profits insofar as the lender

sets a positive value of  $R$ .

Overall, we can conclude that the result on short-termism derived under competitive financial markets is even reinforced under monopolistic lending: in the competitive benchmark, the long-run project can be undertaken with limited commitment, provided recovery rates are big enough. In this case, the project cannot be implemented independently from recovery rates' value.

## 9 Collateralized Loan

In this section, we present the results of the contracting and bankruptcy games of Section 6 when the entrepreneur can pledge collateral,  $C$ .<sup>32</sup> More specifically, we assume that  $C$  consists of entrepreneur's existing non-project-related wealth<sup>33</sup> and that it can be seized by the lender in case of first period project's failure. Furthermore, the existence of  $C$  affects the implementation of the long-term project  $L$  differently depending on whether the procedure entitles the entrepreneur to invoke the *automatic stay* of creditor's claim. If the automatic stay is not contemplated by the bankruptcy law, then the lender can decide either to seize the collateral or to allow for project's continuation in bankruptcy. Instead, if protected by the automatic stay, the entrepreneur has the right to enter unilaterally in bankruptcy and the collateral is added to project's continuation value, so that lender's recovery rates increase.

It has to be remarked that  $C$  cannot violate first period limited liability constraint, therefore one must have that the following feasibility condition holds:  $C \leq \Pi - I$ .<sup>34</sup> Also, the entrepreneur has incentive to raise as much collateral as possible, subject to the feasibility condition, because if project  $L$  is chosen her utility would be bigger than if the short-term project is chosen.

To begin with, consider the case in which *the procedure does not prescribe the automatic stay* of lender's claim. Then the lender may decide to seize the collateral instead of continuing with the rescue phase in bankruptcy, provided the value of the collateral is bigger than the project's continuation value. Accordingly, the budget constraint would be naturally

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<sup>32</sup>We follow Tirole 2006, Chapter 4, in the way collateral is modeled.

<sup>33</sup>More concretely,  $C$  may consist of wealth that is too illiquid to be invested directly into the project, but can be used as collateral, like an entrepreneur's house or firm's stock holdings in other companies.

<sup>34</sup>This condition is obtained by substituting into the limited liability constraint the optimal value of  $R$ , which results from a binding lender's participation constraint using the assumption of competitive financial markets.

tightened. Indeed, the truth-telling constraint could be rewritten as in what follows:

$$\Pi - I + \hat{\Pi} - \hat{I} \geq \Pi - C.$$

Hence, if the entrepreneur is able to raise an amount of collateral that satisfies the truth-telling condition and the feasibility condition, project  $L$  is chosen at equilibrium. The intuition is that, by seizing  $C$ , the lender can implement a particularly harsh punishment in case of failure, even harsher than in the full commitment scenario. Remarkably, this type of lender's conduct in failure states is consistent with the evidence in Franks and Sussman (2005), which finds that in the presence of highly collateralized debt a senior lender is more likely to seize the collateral instead of commencing the rescue process.

If *the procedure prescribes the automatic stay*, then the collateral is used by the entrepreneur in addition to the income generated by project's continuation in bankruptcy. Therefore, in this case, the value of  $\hat{r}$  increases to  $\min\{\hat{\Pi} - \hat{I} - \hat{B} + C, I\}$ , so that if the entrepreneur is able to raise  $C$  such that  $\hat{\Pi} - \hat{I} - \hat{B} + C \geq I$  and the feasibility condition is satisfied, then the truth-telling constraint holds and project  $L$  is chosen at equilibrium.

Concluding, in both scenarios collateral increases the scope for the implementation of the long-term project. However, only in the case without automatic stay the “soft budget constraint” problem is fixed, as in that case the lender is entitled to decide whether to seize the collateral and stop project continuation independently from the procedure.

### Proposition 5.

*Under limited commitment, collateral facilitates the choice of the long-term project  $L$ .*

The result in Proposition 5 is delivered by focusing on a lender-borrower couple. The analysis could be greatly enriched by looking at a model with multiple lenders and analyzing whether the same results would carry over (see Bolton and Scharfstein (1996) and Berglöf et al. (forthcoming) for frameworks with multiple lenders), but this is not the scope of this paper.

## 10 Testable Predictions and Policy Conclusion

The paper delivers two main testable predictions. The *first* consists of showing that, by worsening the agency problem, “soft” bankruptcy systems generate bigger indirect costs.<sup>35</sup>

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<sup>35</sup>In this model, we deal with indirect costs because we show that agency costs paid by investors increase when the entrepreneur anticipates a lenient bankruptcy procedure. Direct costs, instead, would comprise of

This prediction is consistent Franks and Sussman (2005). In particular, Franks and Sussman (2005) shows that, in the UK, banks commit to a severe stance towards debt renegotiations and it is argued that this is done to avoid strategic default. In Section 6, we have shown that, unless recovery rates are not big enough to allow for the full recouping of the outstanding liability, then the entrepreneur would always default strategically by reporting a nil payoff at the end of the first period.

The *second* and major prediction of the paper regards the effect that the limited commitment problem characterizing “soft” procedures has on ex ante investment choices: more specifically, in our model, agency costs increase to generate a bias for short-termism. This result is consistent with the evidence provided by several empirical studies on the pressure exerted by stake-holders on American corporate executives for the achievement of short-term objectives.<sup>36</sup> Further evidence to our finding is provided by Qian and Strahan (2007) and John et al. (2008). The former shows that stronger creditor protection is associated with lower interest rates and longer term lending, the latter proves that stronger creditor protection triggers more value-enhancing investments. Interestingly, coherently with our theoretical analysis and results, John et al. (2008) claims that stronger creditor protection hampers managers’ rent extraction behavior and triggers efficient investment choices .

The conclusion conveyed by this paper is that it is the joint rights on the entrepreneur’s side (to file unilaterally for bankruptcy, to decide on the firm’s restructuring and search for new funds), that exacerbate agency costs. Consequently, the bankruptcy reforms that implement a system which limits the capability of the bankrupt entrepreneur to extract rents from the distressed company during the reorganization phase, like the German one, should be less afflicted by the inefficiencies we highlight. This conclusion is also corroborated by the evidence in Bharath et al. (2007), in which the authors show that management turnover in Chapter 11 has increased by 65% since 1990 and is observed in 37.7% of reorganization cases

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the expenses necessary to carry out the process of reorganization/liquidation. See Senbet and Seward (1995) for a survey over indirect and direct costs of bankruptcy.

<sup>36</sup>More specifically, the survey by Poterba and Summers (1995) shows that American CEOs are perceived to have a time horizon considerably shorter than their competitors in Europe. Also, Poterba and Summers (1995), as well as Blume et al. (1980), provides an estimate of firms’ cut-off rates that substantially exceeds the real market discount rate. Finally, Corbett (1987) points to the difference in funded projects’ length to show that Anglo-Saxon corporations are subject to a stronger bias towards short-termism than their German and Japanese counterparts. The theoretical literature has usually explained this evidence comparing the binding role that the risk of takeovers have in the American economy with the long-term horizons that the relationship-banking system gives to firms in Continental Europe and Japan. This paper, instead, proposes an alternative theory based on the way bankruptcy law affects ex ante entrepreneur’s incentives.

in 2000. Remarkably, such an increase has been accompanied by the decrease of Absolute Priority Rule (APR hereafter) violations in Chapter 11.<sup>37</sup> This piece of evidence bears witnesses to a growing influence exerted by creditors in Chapter 11, at the expenses of the bankrupt management. Our model rationalizes these results showing that tightening the termination threat reduces the indirect costs of bankruptcy.

## 11 Final Remarks

We employ a model with repeated moral hazard in which an entrepreneur can choose between a long-term and a short-term project: the former is more valuable than the latter but is subject to the risk of bankruptcy. Crucially, “soft” bankruptcy is modeled as a renegotiation game and gives the entrepreneur the right to start a process of financial restructuring.

The main insight of the paper is that, under a “soft” procedure, the implementation of the optimal financing contracts is subject to a problem of “soft budget constraint”, for which the lender is tempted to renegotiate the termination clause and let the entrepreneur continue, if recovery rates increase. In the presence of moral hazard, the relaxation of the termination decision increases agency costs making the long-term strategies unprofitable and creating a bias for short-termism.

We analyze the robustness of the short-termism result, show that it holds in an environment with monopolistic lending and if the law allows the bankrupt entrepreneur to devise a process of technological restructuring. In particular, in the extension with bankruptcy and technological restructuring, bankruptcy allows the entrepreneur to rescue the firm’s value after a first period low outcome, which can be caused either by opportunistic behavior or by an adverse, exogenous shock. The resulting equilibrium features short-termism when the moral hazard problem is particularly harsh. However, it also features an efficient investment choice if the likelihood of the exogenous shock is high enough. Finally, we look at a variant of the main model with collateralized loan and show that the soft-budget constraint problem may be alleviated when the entrepreneur can pledge collateral.

Although not directly related, our model can be employed to understand the possible consequences of the rescue plan decided by main western countries to counteract the financial crisis that affected the international banking system in the Fall of 2008. In an effort to inject trust in the financial markets, governments have guaranteed to intervene and protect

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<sup>37</sup>The APR determines the order of creditors’ claims reimbursement in bankruptcy. It states that creditors who have secured their loans have seniority over other creditors, and, therefore, have the right to be paid back first.

major banks against the risk of failure. In this paper, we highlight that the likely effect of such a lenient policy is to increase the pressure exerted by investors for short-run corporate results, unless it is not accompanied by the turnover of the incumbent management found liable.<sup>38</sup>

## A Proof of Lemma 1

In this section, we derive the optimal contract that implements the long run investment project  $L$  under the assumption of *full commitment*.

$$\begin{aligned}
& \max_{\{R, \hat{R}\} \{\zeta_\Pi, \zeta_0\}} \Pi - R + \zeta_\Pi(\hat{\Pi} - \hat{R}) \\
& \Pi - R + \zeta_\Pi(\hat{\Pi} - \hat{R}) \geq \begin{cases} \Pi + \zeta_0(\hat{\Pi} - \hat{R}) & (TT) \\ B + \zeta_0(\hat{\Pi} - \hat{R}) & (IC) \\ 0 & (ePC) \end{cases} \\
& R - I + \zeta_\Pi(\hat{R} - \hat{I}) \geq 0 \quad (lPC) \\
& \Pi - R \geq 0 \quad (LL_1) \\
& \hat{\Pi} - \hat{R} \geq 0 \quad (LL_2) \\
& (\zeta_\Pi, \zeta_0) \in \{0, 1\} \quad (FC)
\end{aligned}$$

The entrepreneur maximizes her utility subject to three incentive constraints: the truth telling constraint ( $TT$ ), the incentive constraint related to effort provision ( $IC$ ), and her participation constraint ( $ePC$ ). Also, the entrepreneur takes into account the lender's participation constraint ( $lPC$ ), first and second period limited liability constraints, ( $LL_1$ ) and ( $LL_2$ ), and the feasibility conditions ( $FC$ ).

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<sup>38</sup>Particularly suggestive is the following quotation by the UK Prime Minister Gordon Brown, commenting on the necessity to introduce stronger regulation concerning banks' management rewarding schemes: "We are leading the world in sweeping away the old short-term bonus culture of the past and replacing it with determination that there are no rewards for failure and rewards only for long-term success". *The Guardian*, 10<sup>th</sup> February 2009.



Conditional on project continuation, in the second period, perfect competition drives the repayment required by the lender to  $\hat{I}$ , so that  $\hat{R} = \hat{I}$ . This implies that the entrepreneur is the residual claimant and gets the all net present value generated by the project, which is equal to  $\hat{\Pi} - \hat{I}$ .

The optimal contract is completed by first period repayment and lender's refunding decisions. First of all, notice that due to Assumption (1.i), the only relevant incentive constraint is  $(TT)$ . Then, financial markets' perfect competition implies that first period repayment,  $R$ , is equal to  $I$ . Finally, the problem can be simplified setting  $\zeta_0 = 0$  and  $\zeta_{\Pi} = 1$ , the entrepreneur is not rewarded if she reveals 0, while she is refunded if she reveals  $\Pi$ : both simplifications improve entrepreneur's incentives, the latter also increases entrepreneur's expected utility. Therefore, at the equilibrium, constraint  $(TT)$  is never binding (thanks to Assumption (1.iv)), while the lender earns zero profits.

Denote by  $\mathcal{C}^{FC}$  the optimal contract that implements strategy  $L$ .  $\mathcal{C}^{FC}$  is given by:

$$\mathcal{C}^{FC} \equiv \{R = I, \hat{R} = \hat{I}\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 0\},$$

at which entrepreneur's utility is equal to:

$$U^{FC} = \Pi - I + \hat{\Pi} - \hat{I} > 0.$$

In order to implement  $L$ , the entrepreneur offers  $\mathcal{C}^{FC}$  to the lender, and the project is started if the latter accepts the deal and provides  $I$ . ■

## B Proof of Proposition 2

The optimization problem is as in what follows.

$$\begin{aligned} & \max_{\{R, \hat{R}\} \{ \zeta_{\Pi}, \zeta_0 \}} \Pi - R + \zeta_{\Pi}(\hat{\Pi} - \hat{R}) \\ \Pi - R + \zeta_{\Pi}(\hat{\Pi} - \hat{R}) & \geq \begin{cases} \Pi + \zeta_0(\hat{\Pi} - \hat{R}) - \hat{r} & (TT) \\ B + \zeta_0(\hat{\Pi} - \hat{R}) - \hat{r} & (IC) \\ 0 & (ePC) \end{cases} \\ R - I + \zeta_{\Pi}(\hat{R} - \hat{I}) & \geq 0 \quad (lPC) \\ \Pi - R & \geq 0 \quad (LL_1) \end{aligned}$$

$$\begin{aligned}\widehat{\Pi} - \widehat{R} &\geq 0 & (LL_2) \\ (\zeta_{\Pi}, \zeta_0) &\in \{0, 1\} & (FC)\end{aligned}$$

To begin with,  $\hat{r}$  reduces the rent that the entrepreneur obtains when she reveals a nil payoff and the firm is in bankruptcy. Then, two scenarios must be distinguished. If the firm is not in bankruptcy, by perfect competition, the required payment in the second period,  $\widehat{R}$ , is equal to  $\widehat{I}$ .

If the firm is in bankruptcy, the game presented in Section 4.1 takes place. More specifically, if the entrepreneur finds a new lender, this makes her an offer at which the entrepreneur is residual claimant and the new lender breaks even in expectation. Consequently, conditional on offer acceptance, second period expected pledgeable income is equal to  $\widehat{\Pi} - \widehat{I} - \widehat{B} > 0$ . However, before the project is implemented, the old lender must agree on continuation.

The old lender has monopoly power in the ultimatum game with the entrepreneur: he makes her an offer consisting in the value of  $\hat{r}$  required to allow continuation. In particular, the initial lender asks at least the minimum value between the pledgeable income of the project and the value of the outstanding liability, that is, the old lender offers either  $\hat{r} > \min\{\widehat{\Pi} - \widehat{I} - \widehat{B}, I\}$  or  $\hat{r} = \min\{\widehat{\Pi} - \widehat{I} - \widehat{B}, I\}$ . In the former case, the lender would implicitly enforce the ex ante optimal contract, because the entrepreneur would not be able to repay and parties' payoffs would be zero at the end of bargaining. In the latter case, the offer is feasible and would permit the old lender to improve recovery rates.

At the SPE of the bargaining game, the old lender asks for  $\hat{r} = \min\{\widehat{\Pi} - \widehat{I} - \widehat{B}, I\}$  and the entrepreneur accepts. Consequently, recovery rates increase and the refunding decisions,  $\{\zeta_{\Pi}, \zeta_0\}$ , become ineffective (that is,  $\zeta_{\Pi} = \zeta_0 = 1$ ). Using the results we have derived so far, the truth-telling constraint can be rewritten as:

$$\Pi - I + (\widehat{\Pi} - \widehat{I}) \geq \Pi + (\widehat{\Pi} - \widehat{I}) - \min\{\widehat{\Pi} - \widehat{I} - \widehat{B}, I\},$$

Hence, one has that:

- i.* If  $\widehat{\Pi} - \widehat{I} - \widehat{B} < I$ , project  $S$  is chosen by the entrepreneur, because the truth-telling constraint is not satisfied.
- ii.* If  $\widehat{\Pi} - \widehat{I} - \widehat{B} \geq I$ , the entrepreneur offers  $\mathcal{C}^{LC}$  to the lender.

$$\mathcal{C}^{LC} \equiv \{R = I, \widehat{R} = \widehat{I}, \hat{r} = I\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 1\}.$$

Borrower's utility under  $\mathcal{C}^{LC}$ , denoted  $U^{LC}$ , is:

$$U^{LC} = \Pi - I + \hat{\Pi} - \hat{I} > 0$$

and the lender breaks even in expectation. Finally, if the lender accepts the offer, project  $L$  is started. ■

## C Proof of Lemma 2

The optimization problem follows.

$$\begin{aligned} & \max_{\{R, \hat{R}\} \{ \zeta_{\Pi}, \zeta_0 \}} \sigma[\Pi - R + \zeta_{\Pi}(\hat{\Pi} - \hat{R})] \\ \sigma[\Pi - R + \zeta_{\Pi}(\hat{\Pi} - \hat{R})] & \geq \begin{cases} \sigma[\Pi + \zeta_0(\hat{\Pi} - \hat{R})] & (TT) \\ B & (IC) \\ 0 & (ePC) \end{cases} \\ \sigma R - I + \sigma \zeta_{\Pi}(\hat{R} - \hat{I}) & \geq 0 \quad (lPC) \\ \Pi - R & \geq 0 \quad (LL_1) \\ \hat{\Pi} - \hat{R} & \geq 0 \quad (LL_2) \\ (\zeta_{\Pi}, \zeta_0) & \in \{0, 1\} \quad (FC) \end{aligned}$$

First of all, perfect competition on financial markets implies that the payment required in the second period is equal to  $\hat{I}$ . Moreover, as for Lemma 1, the refunding decision in case of success and no adverse shock is equal to one, while the refunding decision associated to a nil outcome is equal to zero. Then, lender's zero profit condition implies that first period transfer is equal to  $I/\sigma$ . Consequently,  $(TT)$ ,  $(IC)$  and  $(LL_1)$  can be rewritten, as:

$$\begin{aligned} \sigma(\hat{\Pi} - \hat{I}) - I & \geq 0 \quad (TT) \\ \sigma\Pi - I + \sigma(\hat{\Pi} - \hat{I}) & \geq B \quad (IC) \\ \sigma\Pi - I & \geq 0 \quad (LL_1) \end{aligned}$$

Denote by  $\mathcal{C}^{NR}$  the optimal contract that implements strategy  $L$  in the case without bankruptcy and technological restructuring.  $\mathcal{C}^{NR}$  is given by:

$$\mathcal{C}^{NR} \equiv \{R = R^{NR} \equiv I/\sigma, \hat{R} = \hat{I}\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 0\},$$

at which entrepreneur's utility is equal to:

$$U^{NR} = \sigma\Pi - I + \sigma(\hat{\Pi} - \hat{I}).$$

Provided the limited liability condition, the incentive constraint and the truth telling constraint are satisfied. The entrepreneur offers  $\mathcal{C}^{NR}$  to the lender, and project  $L$  is started if

$$\sigma\Pi - I + \sigma(\hat{\Pi} - \hat{I}) \geq \Pi_S.$$

■

## D Proof of Lemma 3

In this section, we derive the optimal contract that implements the long run investment project  $L$  in the case with bankruptcy and technological restructuring. The optimization program is given by

$$\max_{\{R_{\Pi}^b, R_0^b\}, \{R_{\Pi}, R_0\}, \{p_{\Pi}, p_0\}, \{\zeta_{\Pi}, \zeta_0\}, \hat{R}} \sigma[\Pi - p_{\Pi}(R_{\Pi}^b + \zeta_{\Pi}\hat{r}_{\Pi}) - (1 - p_{\Pi})R_{\Pi}] + (1 - \sigma)[-p_0(R_0^b + \zeta_0\hat{r}_0) - (1 - p_0)R_0] + [\sigma\zeta_{\Pi} + (1 - \sigma)\zeta_0](\hat{\Pi} - \hat{R})$$

$$\begin{aligned} & \sigma[\Pi - p_{\Pi}(R_{\Pi}^b + \zeta_{\Pi}\hat{r}_{\Pi}) - (1 - p_{\Pi})R_{\Pi}] + (1 - \sigma)[-p_0(R_0^b + \zeta_0\hat{r}_0) + \\ & -(1 - p_0)R_0] + [\sigma\zeta_{\Pi} + (1 - \sigma)\zeta_0](\hat{\Pi} - \hat{R}) \geq \begin{cases} B - p_0(R_0^b + \zeta_0\hat{r}_0) - (1 - p_0)R_0 + \zeta_0(\hat{\Pi} - \hat{R}) & (IC_1) \\ 0 & (ePC) \end{cases} \end{aligned}$$

$$\sigma[p_{\Pi}(R_{\Pi}^b + \zeta_{\Pi}\hat{r}_{\Pi} - K) + (1 - p_{\Pi})R_{\Pi}] + (1 - \sigma)[p_0(R_0^b + \zeta_0\hat{r}_0 - K) + (1 - p_0)R_0] + [\sigma\zeta_{\Pi} + (1 - \sigma)\zeta_0](\hat{R} - \hat{I}) \geq I \quad (lPC)$$

$$\begin{cases} R_{\Pi}^b \leq R_0 & \forall (p_{\Pi} = 1, p_0 = 0), \quad R_0^b \leq R_{\Pi} & \forall (p_0 = 1, p_{\Pi} = 0) \\ R_{\Pi} = R_0 = R & \text{if } p_{\Pi} = p_0 = 0 \end{cases} \quad (IC_2)$$

$$\begin{cases} \Pi - R_{\Pi} \geq 0 & R_0 \leq 0 \\ \Pi - R_{\Pi}^b \geq 0 & R_0^b \leq 0 \end{cases} \quad (LL_1)$$

$$\hat{\Pi} - \hat{R} \geq 0 \quad (LL_2)$$

$$(\zeta_{\Pi}, \zeta_0) \in \{0, 1\}$$

$$(p_{\Pi}, p_0) \in \{0, 1\}$$

$K$  is the cost that must be sunk to retrieve the true outcome in bankruptcy and the couple  $(p_{\Pi}, p_0)$  determines the bankruptcy policy: if  $p_j = 1$ , with  $j = \Pi, 0$ , then the contract requires that the firm is put in bankruptcy and the true outcome is monitored at the cost  $K$ .  $R_{\Pi}^b$ ,  $\hat{r}_{\Pi}$ ,  $R_0^b$  and  $\hat{r}_0$  characterize the payments and recovery rates required in bankruptcy as function of the first period outcome, while  $R_{\Pi}$  and  $R_0$  denote the payments required out of bankruptcy.

First of all, we can rewrite the problem setting  $\zeta_{\Pi} = \zeta_0 = 1$ , as in Section 6.<sup>39</sup>

Moreover, all transfers must satisfy first and second period limited liability conditions. However, with respect to the problem in Section 6, we also need to take into account the set of incentive compatibility constraints ( $IC_2$ ). These make sure that the transfers required out of bankruptcy do not depend on revealed outcome, otherwise the entrepreneur would lie as to avoid the bigger repayment. Similarly, the payments required in bankruptcy must be smaller than those out of bankruptcy, otherwise the entrepreneur would report the outcome that entails a lower repayment.

In case a nil outcome is reported, the firm is always put in bankruptcy ( $p_0 = 1$ ), and verification costs  $K$  paid by the lender, because otherwise the entrepreneur would claim to have zero cash and repay nothing. Conversely, the optimal contract must feature  $p_{\Pi} = 0$ : if the outcome is high, the entrepreneur can repay the amount specified in the contract (provided limited liability is satisfied).

Then, before solving for the optimal contractual payments, together with the bankruptcy policy that makes sure that the true outcome is revealed by the entrepreneur, we can operate a number of simplifications. Indeed, invoking the assumption of perfectly competitive financial markets, we can set  $\hat{R} = \hat{I}$  and ( $IPC$ ) binding, moreover, ( $LL_1$ ) implies that  $R_0 = R_0^b = 0$ .

As for  $\hat{r}_0$ , in analogy to Section 6, this is given by  $\min\{\hat{\Pi} - \hat{I} - \hat{B}, I + K\}$ : at the bargaining game with the entrepreneur, the old lender formulates an offer at which he gets the minimum between the full value of the project in the second period and the allotment invested to start the project and verify the true state. Finally, denote by  $R^R = R_{\Pi}$  the value that solves a

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<sup>39</sup>In Section 6, we prove that, in absence of commitment, the assumption of second period positive pledgeable income implies that the refunding decisions play no role whatsoever.

binding (*IPC*).

In what follows, we first present the case in which recovery rates (net of  $K$ ) are smaller than first period investment's value  $I$ , then the one in which recovery rates in bankruptcy allow to fully recoup  $I$ .

Case  $\hat{r}_0 < I + K$

If  $\hat{r}_0 = \hat{\Pi} - \hat{I} - \hat{B} < I + K$ , the lender breaks even in expectation if:

$$R^R = \frac{I - (\hat{\Pi} - \hat{I} - \hat{B} - K)(1 - \sigma)}{\sigma} > I.$$

Using the results we have derived so far, condition ( $IC_1$ ) can be written as:

$$\sigma\Pi - I + (\hat{\Pi} - \hat{I} - \hat{B}) - (1 - \sigma)K \geq B$$

Denote by  $\mathcal{C}^R$  the optimal contract that implements strategy  $L$  in the case with bankruptcy and technological restructuring.  $\mathcal{C}^R$  is given by:

$$\mathcal{C}^R \equiv \left\{ R_{\Pi} = R^R \equiv \frac{I - (\hat{\Pi} - \hat{I} - \hat{B} - K)(1 - \sigma)}{\sigma}, R_{\Pi}^b = R_0^b = R_0 = 0, \hat{R} = \hat{I} \right\},$$

$$\{p_{\Pi} = 0, p_0 = 1\}, \quad \{\zeta_{\Pi} = 1, \zeta_0 = 1\}, \quad \{\hat{r}_{\Pi} = 0, \hat{r}_0 = \hat{\Pi} - \hat{I} - \hat{B}\}.$$

$\mathcal{C}^R$  can be implemented if first period limited liability,

$$\Pi \geq \frac{I - (\hat{\Pi} - \hat{I} - \hat{B} - K)(1 - \sigma)}{\sigma},$$

and the incentive constraint related to effort provision,

$$\sigma\Pi - I + (\hat{\Pi} - \hat{I} - \hat{B}) - (1 - \sigma)K \geq B,$$

are satisfied. Then, borrower's utility, denoted  $U^R$ , is equal to:

$$U^R = \sigma\Pi - I + (\hat{\Pi} - \hat{I}) - K(1 - \sigma).$$

The lender breaks even in expectation. Finally, the entrepreneur offers  $\mathcal{C}^R$  to the lender, and the long run project  $L$  is started if:

$$\sigma\Pi - I + (\widehat{\Pi} - \widehat{I}) - K(1 - \sigma) \geq \Pi_S.$$

Case  $\hat{r}_0 = I + K$

If  $\hat{r}_0 = I + K \geq \widehat{\Pi} - \widehat{I} - \widehat{B}$ , the optimal contract is given by

$$\mathcal{C}_s^R \equiv \{R_\Pi = I, R_\Pi^b = R_0 = R_0^b = 0, \widehat{R} = \widehat{I}\},$$

$$\{p_\Pi = 0, p_0 = 1\}, \quad \{\zeta_\Pi = 1, \zeta_0 = 1\}, \quad \{\hat{r}_\Pi = 0, \hat{r}_0 = I + K\}.$$

$\mathcal{C}_s^R$  can be implemented if the incentive constraint related to effort provision,

$$\sigma(\Pi + K) \geq B,$$

is satisfied. Then, borrower's utility, denoted  $U_s^R$ , is equal to:

$$U_s^R = \sigma\Pi - I + (\widehat{\Pi} - \widehat{I}) - (1 - \sigma)K.$$

and the lender breaks even in expectation. Finally, the entrepreneur offers  $\mathcal{C}_s^R$  to the lender, and the long run project  $L$  is started if:

$$\sigma\Pi - (1 - \sigma)K + (\widehat{\Pi} - \widehat{I} - I) \geq \Pi_S.$$

■

## E Proof of Corollary 1

In this section, we want to show that in a non-empty range of values of  $\sigma$ , the implementation of the long run project is put at risk by renegotiation in bankruptcy.

First of all, by using restrictions (a) – (c), one can easily show that  $\sigma_{LL}^{NR} = \sigma_{TT}^{NR} = 1/2 > \sigma_{LL}^R$ . In other words, the truth telling constraint and the limited liability condition hold in the case without bankruptcy, as well as the limited liability condition in the case with bankruptcy and restructuring. Then, the relevant conditions are the incentive constraints.

Moreover, notice that  $\sigma_{IC}^{NR}$  and  $\sigma_{IC}^{NR}$  lie in the interval  $(1/2, 1)$  under the conditions set up in Corollary 1. Indeed,  $\sigma_{IC}^{NR} < 1$  if  $\Pi > B$ ,  $\sigma_{IC}^{NR} > 1/2$  if  $\Pi < 2B$  and  $1 > \sigma_{IC}^R > 1/2$  if  $2B > \Pi > 4B/3$ . Finally, we need to show that  $\sigma_{IC}^R \geq \sigma_{IC}^{NR}$ :

$$\sigma_{IC}^R = \frac{2B + K - \frac{\Pi}{2}}{\Pi + K} > \frac{B + \frac{\Pi}{2}}{2\Pi} = \sigma_{IC}^{NR}.$$

Solving for such inequality, one has that:

$$\begin{aligned} 2\Pi(B + \Pi/2) + 2\Pi(K - \Pi + B) &> (\Pi + K)(B + \Pi/2) \Rightarrow \\ 2\Pi(K - \Pi + B) &> (K - \Pi)(B + \Pi/2) \Rightarrow \\ (\Pi - K)(B + \Pi/2) &> 2\Pi(\Pi - K) - 2\Pi B \Rightarrow \\ (\Pi - K)(3\Pi/2 - B) &< 2\Pi B \Rightarrow \\ \Pi(3\Pi/2 - 3B) &< K(3\Pi/2 - B) \end{aligned}$$

The left-hand side of the last inequality is negative if  $\Pi < 2B$ , which completes the proof of Corollary 1. ■

## F Proof of Lemma 4

In this section, we derive the optimal contract that implements the long run investment project  $L$  under the assumption of *full commitment* and monopolistic lending.

$$\begin{aligned} \max_{\{R, \hat{R}\}\{\zeta_\Pi, \zeta_0\}} R - I + \zeta_\Pi(\hat{R} - \hat{I}) \\ \Pi - R + \zeta_\Pi(\hat{\Pi} - \hat{R}) \geq \begin{cases} \Pi + \zeta_0(\hat{\Pi} - \hat{R}) & (TT) \\ B + \zeta_0(\hat{\Pi} - \hat{R}) & (IC) \\ 0 & (ePC) \end{cases} \\ R - I + \zeta_\Pi(\hat{R} - \hat{I}) \geq 0 & \quad (lPC) \\ \Pi - R \geq 0 & \quad (LL_1) \\ \hat{\Pi} - \hat{R} \geq 0 & \quad (LL_2) \\ (\zeta_\Pi, \zeta_0) \in \{0, 1\} & \quad (FC) \end{aligned}$$



If the entrepreneur is solvent in the first period, in the second period the lender rewards her with  $\widehat{B}$ , as to induce effort and extract  $\widehat{R} - \widehat{I} = \widehat{\Pi} - \widehat{I} - \widehat{B}$ . Conversely, if insolvent in the first period, the entrepreneur is put in liquidation.

By Assumption (1.i), the only relevant incentive constraint is  $(TT)$ , moreover, this constraint is binding at equilibrium, otherwise the lender could always profitably increase  $R$  without violating  $(TT)$ . As in Appendix A, then, one can set  $\zeta_0 = 0$  and  $\zeta_\Pi = 1$  and consequently have that  $R = \widehat{B} > I$ . The optimal contract, denoted  $\mathcal{C}^{FC,m}$ , follows:

$$\mathcal{C}^{FC,m} \equiv \{R = \widehat{B}, \widehat{R} = \widehat{\Pi} - \widehat{B}\}, \quad \{\zeta_\Pi = 1, \zeta_0 = 0\}.$$

Lender's utility, given by project  $L$  pledgeable income, and denoted by  $V^{FC,m}$ , is equal to:

$$V^{FC,m} = \widehat{\Pi} - \widehat{I} - I > 0.$$

Entrepreneur's utility,  $U^{FC,m}$ , amounts to  $\Pi$ . Therefore, at equilibrium, if  $V^{FC,m} > \Pi_S$  the lender offers  $\mathcal{C}^{FC,m}$  to the entrepreneur and the long-term project is started if the entrepreneur accepts. ■

## G Proof of Proposition 4

The optimization problem is the same as in Lemma 4. If the entrepreneur is solvent at the end of the first period, the reward that the old lender promises to the entrepreneur in the second period is equal to  $\widehat{B}$ . In this way he induces effort and generates  $\widehat{\Pi} - \widehat{I} - \widehat{B}$ . In case of bankruptcy, instead, the renegotiation game presented in Section 4.1 takes place. If the entrepreneur finds a new lender, the assumption of competitive financial markets in the renegotiation phase drives new lenders' expected surplus to zero, while makes the entrepreneur the residual claimant. Therefore, second period expected pledgeable income in bankruptcy is the same as out of bankruptcy and equal to  $\widehat{\Pi} - \widehat{B} - \widehat{I} > 0$ .

Before the project is implemented, the old investor must agree on continuation. The old lender has monopoly power in the ultimatum game with the agent and makes an offer to the firm consisting in the value of  $\hat{r}$  required to allow continuation. More specifically, the old lender can offer either  $\hat{r} > \widehat{\Pi} - \widehat{I} - \widehat{B}$  or  $\hat{r} = \widehat{\Pi} - \widehat{I} - \widehat{B}$ . In the former case, the lender would implicitly enforce the ex ante optimal contract, because the entrepreneur would not

be able to repay. In the latter case, the offer is feasible and would permit the old lender to improve recovery rates. At the SPE of this game, the old lender asks for  $\hat{r} = \hat{\Pi} - \hat{B} - \hat{I}$ , which is what he would have been able to extract from the project in case of refunding, and the entrepreneur accepts. Consequently, the refunding decisions,  $\{\zeta_{\Pi}, \zeta_0\}$ , become ineffective and the problem solved at the contracting stage by the entrepreneur can be written as in the following.

$$\max_R R - I + \hat{\Pi} - \hat{I} - \hat{B}$$

$$\Pi - R + \hat{B} = \Pi + \hat{B} \quad (TT)$$

$$R - I + \hat{\Pi} - \hat{I} - \hat{B} \geq 0 \quad (lPC)$$

$$\Pi - R \geq 0 \quad (LL_1)$$

Clearly, a binding  $(TT)$  is violated at any strictly positive value of the first period repayment,  $R$ . ■

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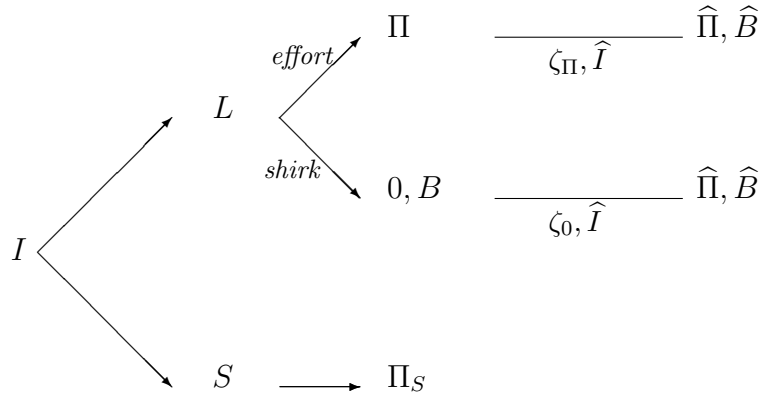
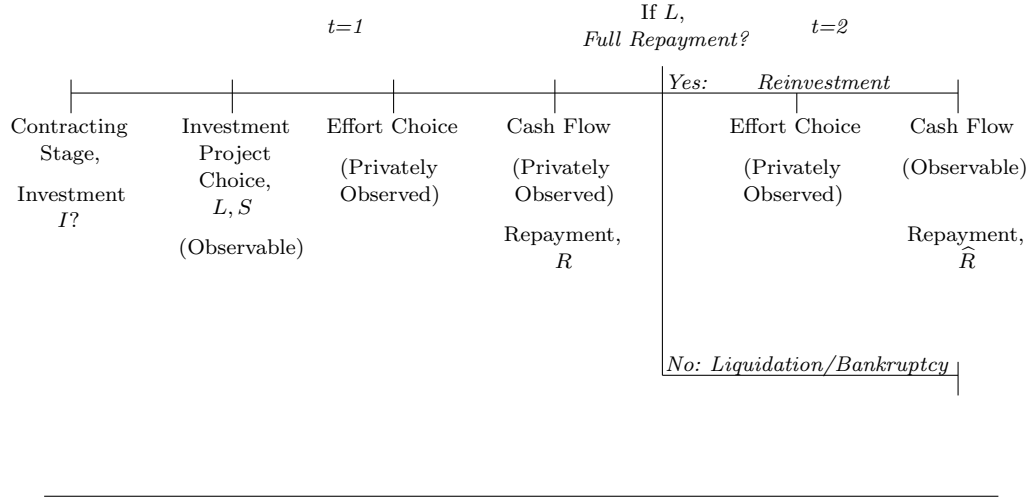
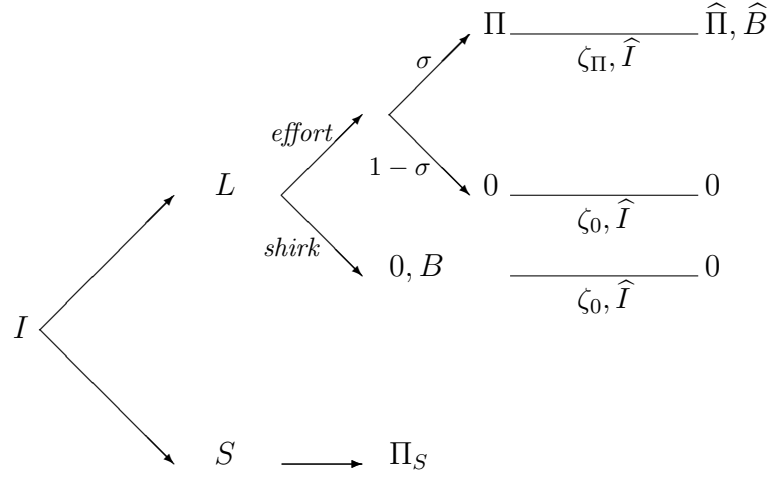


Figure 1: Timeline and Cash Flow

***Cash Flow Without Bankruptcy and Restructuring***




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***Cash Flow With Bankruptcy and Restructuring***

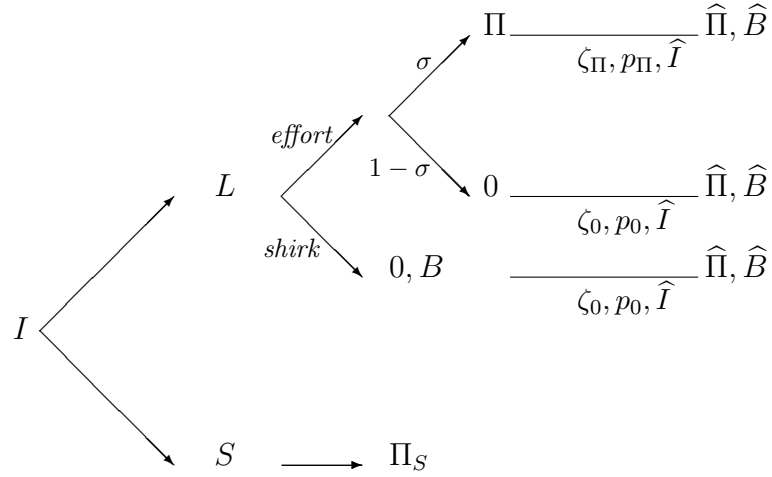


Figure 2: Model with Bankruptcy and Restructuring, Cash Flows